

TRANSLATION OF EUROPEAN PATENT APPLICATION METHOD AND APPARATUS
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THREADED PROJECTION ON A PLATE-SHAPED WORKPIECE

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BACKGROUND OF THE INVENTION

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Method, Machine System and Thread-Cutting Device for Producing a Threaded

Projection on a Plate-Shaped Workpiece and in particular on a Sheet-Metal-Blank This invention

relates to a method for producing a threaded projection on a plate-shaped workpiece, and in particular on a sheet metal blankworkpiece, athe threaded projection that extends at an angle

relative to the principal plane of the workpiece, whereby the threaded projection and is produced in the form of a lug, one end of which connects to and extends on at least one side

from the junction with the remainderbody of the workpiece and which is provided with a

threaded contour, with at least one such threaded contour being produced on at least one

section that is permanently bent at an angle relative to said principal plane of the workpiece.

The invention further relates to a machine system serving to implement said method and encompassing a cutting device for the relief- cutting of lugs on workpieces, a thread cutting device ~~as well as, and~~ a bending device, ~~so that by.~~ By means of the relief- cutting device for cutting lugs on the workpiece, such lugs can be cut clear so as to ~~connect~~ leave a connection at one end to the ~~remaining~~ body of the workpiece, ~~that by means of the.~~ The thread- cutting device can produce a thread ~~can be produced~~ on at least one side of the lug that extends from the remaining workpiece, and that ~~by means of the~~ bending device enables at least one section of the lug can be bent at a permanent angle relative to the principal plane of the workpiece.

Finally, the invention relates to a thread- cutting device within a machine system of the type referred to above.

~~US-~~ United States Patent No. 2,983,179 A describes a prior- art system in ~~that~~ the general category described above. In the case of that prior- art system, the first step is to produce in a sheet- metal ~~blank~~ workpiece two parallel slots extending from the edge of the ~~blank~~ workpiece in the direction of the center of the ~~blank~~ workpiece. The metal tongue thus cut free is subsequently folded up. This results in a folded leg with two closely neighboring sides that extend at an angle perpendicular to the principal plane of the workpiece being processed. Finally, a corresponding die stamps a threaded contour

3—onto the forward ends of the folded-up legs.

The threaded contours on the mutually opposite forward ends of the folded legs constitute segments of a screw thread that will accept a threaded nut.

It is the objective of this invention to improve on ~~the~~this earlier methodology for producing threaded lugs and to introduce devices that permit the implementation of such procedurally improved methodology.

~~According to the invention, the procedural objective is achieved by employing the method described in patent claim 1, while the hardware-related objective is achieved with a machine system per claim 8 and with the thread-cutting device specified in claim 16.~~

SUMMARY OF THE INVENTION

It has now been found that the foregoing and related objects may be readily attained in a method for producing a threaded lug projecting from a plate-shaped workpiece at an angle relative to the principal plane of the workpiece, comprising (a) cutting the workpiece to produce a generally U-shaped lug joined to the body of the workpiece along one end and with a threaded contour on at least one side of the lug extending from the junction with the body of the workpiece; and (b) bending the lug from the plane of the body of the workpiece to form a threaded projection extending at an angle relative to the principal plane of the body of the workpiece.

Generally, threaded contours are cut along both sides of the lug, and transverse cuts are produced in the workpiece at a distance from each other and along the threaded contours on the two sides are mutually offset in the longitudinal direction so as to generate a pitch.

A punch press may be used to cut both the lug and threads. Alternatively, the lug and threaded contour may be generated by a laser beam.

A machining installation for producing the threaded lugs includes a cutting device for the relief cutting of a generally U-shaped lug from the workpiece, a thread cutting device for forming a threaded contour along at least one side of the lug; and a bending device for bending the lug from the plane of the body of the workpiece.

The thread cutting device can produce parallel cuts in the workpiece at a distance from each other and the threaded contours on the two sides of the lug may be offset in the longitudinal direction so as to generate a pitch. The thread cutting device may be a punch press, or a thermal cutting device such as a laser.

In the case of this present invention, the threaded contours are produced on the lugs of the workpiece that are to serve as threaded projections while these still extend in the principal plane of the workpiece. The threaded projections are then bent up in a subsequent procedural step. This optimizes both the procedural and the equipment- related aspects insofar as it eliminates any obstruction in the preceding processing steps by workpiece lugs protruding from the principal plane of the workpiece and obviates the need for hardware design changes for the purpose of assuring smooth processing unimpeded by

~~4~~ workpiece lugs protruding from the principal plane of the workpiece.

~~Special variations of the method per patent claim 1 are described in subclaims 2 through 7.~~

~~Special design variations of the machine system per patent claim 8 are covered in subclaims 9 through 15.~~

According to claims 2 and 9, a A preferred enhancement of the invention offers the possibility of ~~producing~~produces in the principal plane of the workpiece, two transverse parallel cuts which are mutually spaced apart and follow a threaded contour. In this fashion, a threaded projection with two mutually opposite threaded segments can be obtained with a minimum effort in terms of time and hardware complexity. The threaded segments on both sides of the workpiece lug can in any event serve as female- thread segments accepting the male threads of two different structural components. When the threaded contours on the two sides of the workpiece lug are mutually offset so as to create a pitch (~~patent claims 3, and 10~~), the two threaded segments combine to serve as a male thread that most effectively matches the female thread of a structural component that is to be screwed onto the threaded projection.

Patent claims 4 through 6 pertain to variations of the method per this invention that lend themselves particularly well, by virtue of proven and functionally reliable procedural steps, to the creation of at least one threaded contour on the workpiece lug and to the bending of the lug from the principal plane of the workpiece. These in turn lead to corresponding structural advantages of the novel machine-system designs described in claims 11 to 13.

The key concept underlying this invention is the fact that the threaded contours of the threaded projection are produced in the principal plane of the workpiece. Conceivably, as a first step, a U-shaped lug is relief-cut into the workpiece and is then provided with at least one threaded contour in a second step. In a preferred implementation of this invention, the generation of a cut along a threaded contour coincides with the partial relief-cutting of the workpiece lug (claims 7, 14). In other words, relief-cutting the lug on the workpiece and producing a threaded contour on at least one side of the lug extending from the junction with the workpiece is performed in one parallel operation. This results in optimal processing time savings as well as in structural advantages in terms of the machine design.

Finally, the object of patent claim 15 is a design version of the machine system per this invention that permits the largely automated production of threaded projections on flat plate-shaped workpieces.

BRIEF DESCRIPTION OF THE DRAWINGS

The following ~~examples~~description will explain this invention in more detail with the aid of schematic illustrations in which: –

~~Fig.'s~~ Figures 1 to 3 depict in diagrammatic form the progression of athe method applied in producing a threaded projection on a sheet-metal blankworkpiece; and

~~Fig.~~ Figure 4 shows a ~~machin~~machining system for implementing the method outlined~~illustrated~~ in Figures 1 to 3.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

As indicated in ~~fig.~~Figure 1, the first step in the process illustrated consists in relief-cutting a workpiece lug (2) into a sheet metal blankworkpiece 1. At this point the workpiece lug 2 still extends along the principal plane of the metal blankworkpiece 1 and, as indicated by the dotted line in ~~fig.~~Figure 1, connects on one ~~side~~end to the ~~remaining~~-workpiece 4 ~~via~~at the lug junction 3. The workpiece lug 2 is relief-cut along the longitudinal sides of the lug 2 extending from the lug junction 3 while at the same time threaded contours 5, 6 are produced. The threaded contours 5, 6 are identical, exhibiting in the example shown a conventional metric thread profile.

In the direction of the longitudinal sides of the workpiece lug 2 the threaded contours 5, 6 are mutually offset so as to result in a pitch. Imaginary tip- connecting top lines of the threaded contours 5, 6 extend in mutually parallel fashion, as do imaginary ~~inter-~~
~~gullet~~intergullet cannelure- connecting lines. On the far side from the lug junction 3, the workpiece lug 2 is separated from the ~~remaining~~body of the workpiece 4 by a straight cut.

As indicated in ~~fig-~~Figure 2, the workpiece lug 2, once relief- cut and provided with the threaded contours 5, 6, is bent at a permanent angle, in this case at a right angle, relative to the principal plane of the sheet metal ~~blank~~workpiece 1. The fold line 7 of the bend coincides with the lug junction 3 where the workpiece lug 2 meets the ~~remaining~~body of the workpiece 4. The workpiece lug 2 bent away from the principal plane of the ~~blank~~workpiece 1 constitutes a threaded projection with a metric male thread which, combining threaded contours 5, 6, encompasses two threaded segments.

Components with a matching female thread can now be screwed onto the workpiece lug 2, i.e., the threaded projection formed by it. An example of such a component is the nut 8 shown in ~~fig-~~Figure 3.

A machine system 9 capable of implementing the method described above is illustrated in ~~fig. 4. The machine system 9 as shown~~ Figure 4, and includes a cutting station 10 as well as a bending station 11. The cutting station 10 features a conventional laser cutting device 12 mounted on a first machine frame 13. The laser cutting device 12 doubles as a relief- cutting unit for workpiece lugs 2 and as a thread cutting device.

The first machine frame 13 connects to a directly juxtapositioned second machine frame 14. The latter supports a conventional bending device 15 as part of the bending station 11. As can be seen in ~~fig.~~ Figure 4, the sheet metal ~~blankworkpiece~~ workpiece 1 is held down by a ~~blankworkpiece~~ workpiece holder 16 bearing down on its top surface and operating in ~~synchronism~~ synchronization with a bending jaw positioned underneath the ~~blankworkpiece~~ workpiece 1 but obscured in ~~fig.~~ Figure 4. The ~~blankworkpiece~~ workpiece holder 16 and the bending jaw are ~~parts~~ components of a bending press of a conventional- design ~~bending press~~.

In lieu of two separate machine frames 13, ~~44~~ 14, it is possible to use a single, unitary machine frame. If, in place of the laser cutting device ~~42~~ 12, a punch press ~~is~~ may be used for the relief- cutting of workpiece lugs 2 and/or for cutting threaded contours 5, 6 into the ~~blankworkpiece~~ workpiece 1, ~~and~~ a single processing station may suffice. In that case, the punching die and the bending

_____9-tool will have to be successively interchanged in the tool holders of such a processing station. Also conceivably practicable is the use of a punch press as well as of a thermal cutting device for producing workpiece lugs 2 that are provided with at least one threaded contour 5, 6. In that case it would be possible, inter alia, in a first step using the punch press, to relief-cut in the principal plane of the workpiece a lug 2 with all straight edges, whereupon in a following step the thermal cutting device produces at least one threaded contour 5, 6 on the sides of the workpiece lug 2 extending from the junction 3 with the remaining workpiece 4.

The throat of the C-shaped machine frames 13, 14 accommodates a conventional coordinate jigguide system 17. Clamping jaws, (not illustrated,) hold the blankworkpiece 1 against a cross bar 18 of the coordinate jig 17. From underneath the blankworkpiece 1 is supported by a platen 19 that is attached to the machine frames 13, 14. The coordinate jigguide system 17 allows the blankworkpiece 1 to be moved at will in any direction along its horizontal principal plane.

For the relief-cutting of the workpiece lugs 2 with simultaneous generation of threaded contours 5, 6, the coordinate jigguide system 17 moves the blankworkpiece 1 relative to the stationary laser cutting device 12. That movement follows a track whereby, in the progression explained in

~~10~~ connection with ~~fig.~~Figure 1, the workpiece lugs 2 are separated from the body of the remaining workpiece 4 except for the lug junction 3 on one side, with mutually offset threaded contours 5, 6 along their longitudinal sides and with a straight edge on the horizontal side opposite the lug junction 3. Thereupon, the coordinate ~~jig~~guide system 17 positions the ~~blank~~workpiece 1, successively with all workpiece lugs 2 produced in the principal plane of the ~~blank~~workpiece 1, opposite the bending device 15 of the bending station 11 in such fashion that activation of the bending device 15 bends the workpiece lugs 2 along a fold line that coincides with the lug junction 3 of the respective workpiece lug 2. Deviating from the conditions illustrated, it is possible to remove the serrations resulting on the ~~remaining~~body of the workpiece 4 from the generation of the threaded contours 5, 6 on the workpiece lug 2. Such straightening of the corresponding edges in the cutout of the remaining workpiece 4 can be accomplished in a separate step using the laser cutting device 12.

In ~~fig.~~Figure 4, a workpiece lug 2 per ~~fig.~~Figure 2 is bent at a right angle relative to the principal plane of the ~~blank~~workpiece 1. That workpiece lug 2 is in the form of a threaded projection with a male thread which, as described in connection with ~~fig.~~Figure 3, can serve as a "threaded stud" onto which another component can be ~~screwed~~threaded.

All of the functions of the machine system 9 and in particular the movement of the sheet metal ~~blank~~workpiece 1 relative to the laser cutting device 12 and to the bending device 15 are controlled by a CNC controller 20 indicated in ~~fig~~Figure 4.

Patent Claims

- ~~1. Method for producing on a plate-shaped workpiece, and in particular on a sheet metal blank (1), a threaded projection that extends at an angle relative to the principal plane of the workpiece, whereby the threaded projection is produced on the workpiece in the form of a lug (2) one end of which connects to and extends at least on one side from the junction (3) with the remainder of the workpiece (4) and which is provided with a threaded contour (5, 6), at least one such threaded contour (5, 6) being produced on at least one section that is permanently bent at an angle relative to said principal plane of the workpiece, characterized in that a threaded contour (5, 6) is generated on at least one side of the workpiece lug (2) extending from the junction (3) with the remaining workpiece (4) by producing in the principal plane of the workpiece at least one cut along the course of a threaded contour (5, 6), and that the workpiece lug (2) of which at least one side extending from the junction (3) with the remaining workpiece (4) is provided with a threaded contour (5, 6) is permanently bent, with at least one section having at least one threaded contour (5, 6), to form a threaded projection at an angle relative to the principal plane of the workpiece.~~

CLAIMS

Having thus described the invention, what is claimed is:

1. A method for producing a threaded lug projecting from a plate-shaped workpiece, at an angle relative to the principal plane of the workpiece, comprising
2. Method as in claim 1, characterized in that one (a) cutting a workpiece to produce a generally U-shaped lug joined to the body of the workpiece along one end and having a threaded contour (5, 6) each is produced on two sides of the workpiece on at least one side of the lug (2) extending from the junction (3) with the remaining workpiece (4) by providing in the principal plane of the workpiece two transverse, mutually spaced cuts along the course of a threaded contour (5, 6), and that of the workpiece lug (2), featuring a threaded contour (5, 6) on each side at least one bilaterally thread-contoured section is permanently bent in the form of a threaded projection at an angle relative to the principal plane of the workpiece body of the workpiece (4); and
3. Method as in one of the preceding claims, characterized in that the transverse cuts produced in the workpiece at a distance from each other along the course of a threaded contour (5, 6) are mutually offset in the longitudinal direction so as to generate a pitch.
4. Method as in one of the preceding claims, characterized in that at least one cut provided in the principal plane of the workpiece along the course of a threaded contour (5, 6) is produced by means of a punch press.

5. ~~Method as in one of the preceding claims, characterized in that at least one cut~~
~~provided in the principal plane of the workpiece along the course of a threaded~~
~~contour (5, 6) is produced by a thermal cutting process and in particular by laser cutting.~~
6. ~~Method as in one of the preceding claims, characterized in that a bending press is used~~
~~to permanently bend at least a section of the workpiece lug (2) with at least one~~
~~threaded contour (5, 6) (b) bending the lug from the plane of the body of~~
~~the workpiece to form a threaded projection extending at an angle ~~from~~relative to the~~
~~principal plane of the body of the workpiece.~~
7. ~~Method as in one of the preceding claims, characterized in that, by producing a cut in the~~
~~principal plane of the workpiece along the course of a threaded contour (5, 6), the~~
~~workpiece lug (2) is relief-cut on at least one side extending from the junction (3) with the~~
~~remaining workpiece (4).~~
8. ~~Machine system for producing on a plate-shaped workpiece, and in particular on a sheet~~
~~metal blank (1), a threaded projection extending at an angle relative to the principal~~
~~plane of the workpiece, said system encompassing a cutting device for the relief-cutting~~
~~of workpiece lugs (2), a thread-cutting device, as well as a bending device (15), so that~~
~~by means of the cutting device for the relief-cutting of~~

2. The method of forming a threaded lug on a workpiece in accordance with Claim 1 wherein threaded contours (5, 6) are cut along both sides of the lug (2).

~~workpiece lugs (2) into the workpiece, a workpiece lug (2) can be produced by relief cutting and connects at one end to the remaining workpiece (4) via a junction (3) and that by means of the thread-cutting device at least one side of the workpiece lug (2) extending from the junction (3) with the remaining workpiece (4) can be provided with a threaded contour (5, 6) while by means of the bending device (15) at least one section of the workpiece lug (2) can be permanently bent at an angle relative to the principal plane of the workpiece, characterized in that by means of the thread-cutting device at least one cut can be produced in the principal plane of the workpiece along the course of a threaded contour (5, 6) and that by means of the bending device (15) at least one section of the workpiece lug (2) that is provided with a threaded contour (5, 6) on at least one side extending from the junction (3) can be bent in the form of a threaded projection at a permanent angle relative to the principal plane of the workpiece.~~

3. The method of forming a threaded lug on a workpiece in accordance with Claim 2 wherein the transverse cuts are produced in the workpiece at a distance from each other and the threaded contours (5, 6) on the two sides are mutually offset in the longitudinal direction so as to generate a pitch.

~~9. Machine system as in claim 8, characterized in that it includes a thread-cutting device by means of which two transverse cuts can be~~

4. The method of forming a threaded lug on a workpiece in accordance with Claim 1 wherein at least one cut is produced in the principal plane of the workpiece at a distance from each other and along the course of a threaded contour (5, 6), and that by means of the bending device (15) at least a bilaterally thread-contoured (5, 6) section of the workpiece lug (2) that features a threaded contour (5, 6) on both sides can be permanently bent in the form of a by a punch press.

5. The method of forming a threaded lug on a workpiece in accordance with Claim 1 wherein at least one cut is produced in the principal plane of the workpiece along the course of a threaded contour (5, 6) by a thermal cutting process.

6. The method of forming a threaded lug on a workpiece in accordance with Claim 5 wherein said thermal cutting process is cutting with a laser beam.

7. The method of forming a threaded lug on a workpiece in accordance with Claim 1 wherein the bending step is effected in a bending press.

8. A machining installation for producing a threaded projection extending at an angle relative to the principal plane of the plate-like workpiece, including

(a) a cutting device for the relief cutting of a generally U-shaped lug from the workpiece,

(b) a thread cutting device for forming a threaded contour along at least one side of the lug; and

(c) a bending device for bending the lug from the plane of the body of the workpiece.

9. The machining installation in accordance with Claim 8, wherein said thread cutting device can produce two parallel cuts in the principal plane of the workpiece at a distance from each other and along the course of a threaded contour (5, 6).

~~10. Machine system as in claim 8 or 9, characterized in that it includes a thread-~~ 10.

The machining installation in accordance with Claim 8 wherein the thread cutting device by means of which the transverse produces parallel cuts provided in the workpiece at a distance from each other along the course of a threaded contour (5, 6) can be produced with a mutual offset of and the threaded contours (5, 6) on the two sides of the lug are offset in the longitudinal direction so as to generate a pitch.

~~11. Machine system as in one of the claims 8 to 10, characterized in that a punch press is used as the thread-cutting device.~~

11. The machining installation in accordance with Claim 8 wherein said thread cutting device is a punch press.

~~12. Machine system as in one of the claims 8 to 11, characterized in that a thermal-cutting device and in particular a laser cutter (12) is used as the thread-cutting device, and that said thermal or, as appropriate, laser-cutting device (12) and, respectively, the workpiece can be moved relative to each other in a direction parallel to the principal plane of the workpiece.~~

12. The machining installation in accordance with Claim 8 wherein the thread cutting device is a thermal cutting device.

~~13. Machine system as in one of the claims 8 to 11, characterized in that a bending press serves as the bending device.~~

13. The machining installation in accordance with Claim 12 wherein said thermal cutting device is a laser cutting device.

14. The machining installation in accordance with Claim 8 wherein said bending device is a bending press.

~~14. Machine system as in one of the claims 8 to 13, characterized in that the cutting device for the relief-cutting of workpiece~~

15. The machining installation in accordance with Claim 8 wherein the cutting device for the cutting of the lugs (2) also serves as the thread-cutting device and that, by means of this cutting device, the workpiece lug (2) can be relief-cut in the principal plane of the workpiece preferably by producing a cut along the course of a threaded contour (5, 6) on at least one side extending from the junction (3) with the remaining workpiece (4).

~~15. Machine system as in one of the claims 8 to 14, characterized~~

16. The machining installation in accordance with Claim 8 in that it encompasses the machining installation includes a cutting station (10), a bending station (11) and a workpiece transfer jig (17), that the cutting station (10) includes a thread-cutting device and/or a cutting device for the relief-cutting of workpiece lugs (2), that the bending station (11) includes a bending device (15), and that by means of the workpiece transfer jig (17) the workpiece being, and a workpiece coordinate guide system, and wherein the coordinate guide system transports the workpiece processed in the cutting station (10) can be transported to the bending station (11).

~~16. Thread-cutting device in a machine system as in one of the claims 8 to 15, characterized by the features of the thread-cutting device specified in at least one of these claims.~~

Abstract

ABSTRACT

A method, machine system and thread- cutting device for producing a threaded projection on a plate-shaped workpiece and in particular on a sheet-metal blankworkpiece.
~~As part of a method for producing a threaded projection on, and extending at an angle relative to the principal plane of, a plate-shaped workpiece and in particular a sheet metal blank (1), a~~
A workpiece lug (2) is ~~provided~~cut with a threaded contour, ~~for which purpose at least one cut along the course of a threaded contour (5, 6) is produced in the principal plane of the~~
~~workpiece. Next, and~~ at least a section of the workpiece lug (2) featuring at least one threaded contour (5, 6) is permanently bent in the form of a threaded projection extending at the desired angle relative to the principal plane of the workpiece. A machine system (9) for implementing ~~said~~the method encompasses a cutting device for the relief- cutting of workpiece lugs (2) as well as a thread- cutting device. Also included is a bending device (15) by means of which at least a section of the workpiece lug (2) provided

_____2-with at least one threaded contour (5, 6) can be permanently bent relative to the principal plane of the workpiece. A thread-cutting device of the machine system (9) is appropriately configured for that purpose.

(Figure 4)

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Deletion	
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Style change	
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Moved deletion	
Inserted cell	
Deleted cell	
Moved cell	
Split/Merged cell	
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Statistics:	
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